

## WHAT IS CLAIMED IS:

1. An earth leakage detection device (14) for detecting earth leakage in an electrical distribution circuit and for actuating a circuit breaker (12) when earth leakage is detected, the earth leakage detection device (14) comprising:

a housing (52);

5 an earth leakage detection circuit (114) mounted within said housing (52) for detecting earth leakage in the electrical distribution circuit;

an electrically conductive strap (18) arranged to conduct electrical current to the electrical distribution circuit, said electrically conductive strap (18) for providing operating current to the earth leakage detection circuit (114); and

10 a dielectric test switch (115) arranged between said electrically conductive strap (18) and said earth leakage detection circuit (114), said dielectric test switch (115) including a button (84) disposed in said housing (52), wherein manipulating said button (84) causes said dielectric test switch (115) to stop the flow of electrical current from said electrically conductive strap (18) to said earth leakage  
15 detection circuit (114) during dielectric testing.

2. The earth leakage detection device (14) of claim 1, wherein said dielectric test switch (115) includes:

a dielectric test cartridge (87) arranged within said housing (52), said dielectric test cartridge (87) having a clip (516) disposed therein, said clip (516) being  
20 in electrical connection with said electrically conductive strap (18) and arranged to receive a pin (514) extending from said earth leakage detection circuit (114); and

wherein manipulating said button (84) moves said dielectric test cartridge (87) to separate said clip (516) from said pin (514) to stop the flow of electrical current from said electrically conductive strap (18) to said earth leakage  
25 detection circuit (114) during dielectric testing.

3. The earth leakage detection device (14) of claim 2, wherein said dielectric test switch (115) further includes:

a spring (519) arranged to force said clips (516) away from said pins (514) during dielectric testing.

5 4. The earth leakage detection device (14) of claim 2, wherein said dielectric test switch (115) further includes:

10 a dielectric test cartridge extraction lever (515) pivotally secured within said housing (52), said dielectric test cartridge extraction lever (515) having a first end arranged proximate said button (84) and a second end arranged beneath a tab (502) extending from said dielectric test cartridge (87) for moving said dielectric test cartridge (87).

5. The earth leakage detection device (14) of claim 2, wherein said dielectric test switch (115) further includes:

15 a pair of resiliently flexible legs (512) secured within said housing (52), each of said resiliently flexible legs (512) having a detent formed on a free end; and

a protrusion (510) extending from said dielectric test cartridge (87), said protrusion (510) being received between said resiliently flexible legs (512) for holding said dielectric test cartridge (87) in place.

20 6. The earth leakage detection device (14) of claim 1, further comprising:

a trip/reset mechanism (116) mounted within said housing (52), said trip/reset mechanism (116) being configured to actuate the circuit breaker (12) when said button (84) is manipulated.

7. The earth leakage detection device (14) of claim 4, further comprising:

a trip/reset mechanism (116) mounted within said housing (52), said trip/reset mechanism (116) being configured to actuate the circuit breaker (12) when said button (84) is manipulated.

8. The earth leakage detection device (14) of claim 7, wherein said dielectric test switch (115) further includes:

a lever arm (605) pivotally secured within said housing (52), said lever arm (605) including a first end disposed proximate said second end of said dielectric test cartridge extraction lever (515), said lever arm (605) further including a second end arranged proximate said trip/reset mechanism (116), wherein said lever arm (605) causes said trip/reset mechanism (116) to actuate the circuit breaker (12) when said button (84) is manipulated.

9. An earth leakage detection device (14) for detecting earth leakage in an electrical distribution circuit and for actuating a circuit breaker (12) when earth leakage is detected, the earth leakage detection device (14) comprising:

a housing (52);

a transformer (182) mounted within said housing (52), said transformer (182) being arranged to sense an electrical current in the electrical distribution circuit and provide a signal indicative of the electrical current;

an earth leakage detection circuit (114) mounted within said housing (52) for detecting earth leakage in the electrical distribution circuit in response to the signal from said transformer (182); and

a trip/reset mechanism (116) mounted within said housing (52) independently from said transformer (182), said trip/reset mechanism (116) being configured to actuate the circuit breaker (12) in response to the detection of earth leakage by said earth leakage detection circuitry (114).

10. The earth leakage detection device (14) of claim 9, wherein said trip/reset mechanism (116) is resiliently mounted to said housing (52).

11. The earth leakage detection device (14) of claim 9, further including:

5 an electronic component and transformer mounting structure (118) secured within said housing (52), said electronic component and transformer mounting structure (118) including a transformer mounting portion (141) for mounting said transformer (182) thereon.

10 12. The earth leakage detection device (14) of claim 11, further including:

a transformer mounting cover (148) arranged to attach to said electronic component and transformer mounting structure (118);

wherein said transformer (182) includes:

15 a plurality of electrically conductive pass-through straps (286) arranged to conduct electrical current to the electrical distribution circuit, and

20 a toroidal assembly (284) disposed about said plurality of electrically conductive pass through straps (286), said toroidal assembly (284) including a ferrous core and first and second secondary windings (288, 290) wound around said ferrous core, said first secondary winding (288) for providing said signal indicative of the electrical current; and

wherein said transformer mounting cover (148) and said electronic component and transformer mounting structure (118) form an electrically insulative barrier between said toroidal assembly (284) and said plurality of electrically conductive pass-through straps (286).

13. The earth leakage detection device (14) of claim 12, wherein said electronic component and transformer mounting structure (118) includes:

a line side support (294) formed substantially as a hollow circular cylinder (300), and

5 a first plurality of walls (302, 304) bisecting a longitudinal axis of said hollow circular cylinder (300) to divide said hollow circular cylinder (300) into first quadrants (306); and

wherein said transformer cover (148) includes:

10 a load side support (296) formed substantially as a hollow circular cylinder (316), and

15 a second plurality of walls (318) dividing the cylinder into second quadrants (320), each of said second quadrants (320) arranged to receive one of said plurality of electrically conductive pass-through straps (286), and each of said first quadrants (306) arranged to receive one of said second quadrants (320) in registered relationship.

14. A trip/reset mechanism (116) for an earth leakage detection device (14), said trip/reset mechanism (116) including:

a housing;

an auxiliary switch driver (224) extending from said housing;

20 an auxiliary switch carrier (225) disposed on said auxiliary switch driver (224), said auxiliary switch carrier (225) including an angular surface (227) formed thereon, said angular surface (227) being configured for positioning a plunger (222) on an auxiliary switch (112).

15. The trip/reset mechanism (116) of claim 14, further including:

a main carrier (608) slidably secured within said housing, said main carrier (608) including a shoulder (618) formed thereon, said main carrier (608) further including an actuation plunger (100) and said auxiliary switch driver (224) disposed thereon;

a latch lever (610) pivotally secured within said housing, said latch lever (610) including a pin (616) formed thereon for releasably engaging said shoulder (618) on said main carrier (608).

16. The trip/reset mechanism (116) of claim 15, further including:

a roller (617) disposed on said pin (616).

17. The trip/reset mechanism (116) of claim 15, further including:

a mechanical trip test rod (606) extending within said housing and operatively engaged to said latch lever (610) for pivoting said latch lever (610) to disengage said pin (616) from said shoulder (618), said mechanical trip test rod (606) including a mechanical trip test button (75) disposed thereon and extending through an aperture formed in said housing.

18. A trip/reset mechanism (116) for an earth leakage detection device (14), said trip/reset mechanism (116) including:

a housing;

a main carrier (608) slidably secured within said housing, said main carrier (608) including a shoulder (618) formed thereon, said main carrier (608) further including an actuation plunger (100) and said auxiliary switch driver (224) disposed thereon;

a latch lever (610) (pivotally secured within said housing, said latch lever (610) including a pin (616) formed thereon for releasably engaging said shoulder (618) on said main carrier (608); and

a mechanical trip test rod (606) extending within said housing and operatively engaged to said latch lever (610) for pivoting said latch lever (610) to disengage said pin (616) from said shoulder (618), said mechanical trip test rod (606) including a mechanical trip test button (75) disposed thereon and extending through an aperture formed in said housing.

19. The trip/reset mechanism (116) of claim 18, further including:

a roller (617) disposed on said pin (616).

20. An earth leakage detection device (14) for detecting earth leakage in an electrical distribution circuit and for actuating a circuit breaker (12) when earth leakage is detected, the earth leakage detection device (14) comprising:

a base (108) for mounting a plurality of components therewithin;

5 a cover (110) arranged above said base (108), said cover (110) including a recess (82) formed therein, said recess (82) including a plurality of apertures (90, 71) formed on a bottom thereof and a seal tab (72) disposed on said bottom, one of said plurality of apertures (90) for accepting a sensitivity adjustment knob (91); and

10 a tamper-proof cover (68) hingedly secured to said cover (110) and arranged above said recess (82), said tamper proof cover (68) including a slot disposed therein for accepting said seal tab (72), said seal tab (72) being configured for accepting a hasp of a lock.

21. The earth leakage detection device (14) of claim 20, wherein  
15 said tamper-proof cover (68) is formed from clear plastic.

22. The earth leakage detection device (14) of claim 20, wherein  
another of said plurality of apertures (71) accepts a mechanical trip test button (75) extending from a trip/reset mechanism (116) mounted within said base (108).